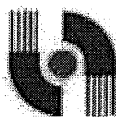


MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2017/2018

PES0024 – ESSENTIAL STATISTICS
(FM31/FM41/FFE31)

21 OCTOBER 2017
9.00 a.m - 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 4 pages with 4 Questions only.
2. Attempt **ALL FOUR** questions.
3. Please print all your answers in the Answer Booklet provided.
4. **Formula** is provided at the back of the question paper.
5. **Statistical book** is provided.

Question 1 (25 marks)

- a. Let the random variable X represent the number of boys in a family of three children. Assume that the probability of boy is 0.36 and girl is 0.64. By using the probability function $f(x) = \binom{n}{x} p^x q^{n-x}$,
- construct a table describing the probability distribution of X . (5 marks)
 - based on part (i), find the standard deviation of X . (6 marks)
- b. Consider the following probability density function for a continuous random variable X ,

$$f(x) = \begin{cases} c(2x - x^2) & ; \quad 0 \leq x < 2.5 \\ 0 & ; \quad \text{elsewhere} \end{cases}$$

- Determine the value of c . (4 marks)
- Find $P(1.5 < x < 2)$. (4 marks)
- Compute the standard deviation. (6 marks)

Question 2 (25 marks)

- a. In a Mathematics test, 5 percent students obtained grade A. Suppose that the total number of students is 10, by using the Binomial formula : $B(n, p) = \binom{n}{x} p^x q^{n-x}$, find the probability that
- at most 2 of the students score grade A in that Mathematics test? (4 marks)
 - more than 3 students do not score grade A in that Mathematics test? (4 marks)
- b. The average salary of waiters in a famous seafood restaurant is RM5 per hour. By using Poisson formula : $P(X = x) = \frac{\lambda^x e^{-\lambda}}{x!}$,
- Find the probability that the waiters receive wages between RM6 and RM 8 per hour. (4 marks)
 - Calculate the mean and standard deviation of the hourly wages of the waiters. (3 marks)
- c. The marks of English Placement Test are normally distributed with an average of 58 and standard deviation of 10.
- Find the probability that the supplementary exam mark for a student is less than 60 marks. (3 marks)

Continued

- ii. Find the probability that the supplementary exam mark for a student is more than 50 marks. (3 marks)
- iii. Find the score of the student who obtains a score that is higher than 10% of all the students. (4 marks)

Question 3 (25 marks)

- a. Given the set of numbers 1, 3, 5, 7 and 9.
- i. Find the population mean and standard deviation. (3 marks)
- ii. Construct a sampling distribution of the mean (without replacement) for sample of size $n = 3$. (8 marks)
- iii. Calculate the sampling error. (4 marks)
- b. The heights of pecan trees follow a normal distribution with mean of 180 cm and a standard deviation of 20 cm. A random sample of 10 plants is taken, and the mean height, \bar{x} is calculated.
- i. What is the probability that a randomly selected pecan tree is between 160 cm and 200 cm. (5 marks)
- ii. If $P(\bar{x} > k) = 0.0571$, find the value of k . (5 marks)

Question 4 (25 marks)

- a. The cars speed (mi/h) measured from a selected highway in City A is normally distributed with a standard deviation $\sigma = 4.08$. A random sample of 12 cars are given as below:

62	61	61	57	61	54
59	58	59	69	60	67

- i. What is the point estimate of the population mean (3 marks)
- ii. What is the margin error associated with the point estimate of the population mean. (3 marks)
- iii. Construct a 95% confidence interval for the mean cars speed. (5 marks)

Continued

- b. An inspection agency is interested in evaluating the actual amount of apple juice that is filled in a 1.5 liter bottle of a juice factory. The manufacturer of the factory has informed the inspection agency that the standard deviation for 1.5-liter bottles is 0.03 liter. A random sample of one hundred 1.5-liter bottles obtained from this factory indicates a sample average of 1.45 liters.
- i. Construct a 97% confidence interval for the mean amount of apple juice that is filled in the 1.5 liter bottles. Express your answer in 3 decimal places. (6 marks)
 - ii. State two factors that can affect the width of confidence interval and discuss the best alternative. (3 marks)
 - iii. Suppose the inspection agency wants to estimate the mean amount of apple juice for all 1.5 liter bottles at a 99% confidence level. How large a sample should the inspection agency select if they want the estimate to be within 0.01 liter of the population mean? (5 marks)

End of Page.

Formula:

1.

	Mean	Variance
Discrete Random Variable X	$\mu = E(X)$ $= \sum xP(x)$	$Var(X) = E(X^2) - [E(X)]^2$ where $E(X^2) = \sum x^2 P(x)$
Continuous Random Variable X	$\mu = E(X)$ $= \int_{-\infty}^{\infty} xf(x)dx$	$Var(X) = E(X^2) - [E(X)]^2$ where $E(X^2) = \int_{-\infty}^{\infty} x^2 f(x)dx$

2.

	Formula	Mean	Standard Deviation
Binomial Probability	$P(x) = \binom{n}{x} p^x q^{n-x}$	$\mu = np$	$\sigma = \sqrt{npq}$
Poisson Probability	$P(x) = \frac{e^{-\lambda} \lambda^x}{x!}$	$\mu = \lambda$	$\sigma = \sqrt{\lambda}$

3. The z value for a value of x: $z = \frac{x - \mu}{\sigma}$

4. The z value for a value of \bar{x} : $z = \frac{\bar{x} - \mu_{\bar{x}}}{\sigma_{\bar{x}}}$
 where $\mu_{\bar{x}} = \mu$ and $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$

5. Point estimate of $\mu = \bar{x}$

$$\text{Margin of error} = \pm 1.96 \sigma_{\bar{x}} = \pm 1.96 \frac{\sigma}{\sqrt{n}} \text{ or } = \pm 1.96 s_{\bar{x}} = \pm 1.96 \frac{s}{\sqrt{n}}$$

6. The $(1 - \alpha)100\%$ confidence interval for μ is $\bar{x} \pm z \frac{\sigma}{\sqrt{n}}$

7. Sample variance: $s^2 = \frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n-1}$